This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

118.65
390

NATURAL SERIES.

FELTER'S

MANUAL

OF

ARITHMETIC

FOR THE USE OF TEACHERS.

NEW YORK:
CHARLES SCRIBNER & CO.,
124 GRAND STREET.
1865.

390

FELTER'S
MANUAL
OF
ARITHMETIC

FOR THE USE OF TEACHERS.

NEW YORK:
CHARLES SCRIBNER & CO.,
124 GRAND STREET.
1865.

Educ T 118.65.390

Harvard College
Library

VE RI
TAS

BOUGHT
FROM THE GIFT OF

CHARLES HERBERT THURBER

3 2044 096 997 127

OFFICE
Board of Education
NEWARK, N. J.

NATURAL SERIES.

A MANUAL OF ARITHMETIC:

DESIGNED TO ACCOMPANY THE NATURAL ARITHMETICAL SERIES.

FOR

THE USE OF TEACHERS.

BY

S. A. FELTER, A. M.,

AUTHOR OF THE "ARITHMETICAL ANALYSIS," ETC.

NEW YORK:
CHAS. SCRIBNER & CO., 124 GRAND STREET.
1865.

Educ T 118.65.390

HARVARD COLLEGE LIBRARY
[illegible] OF
[illegible] THURBER
MAR 5 1926

PREFACE.

In presenting this little work to his fellow teachers, it has not been the author's object to offer *new theories* or *methods* of the study of Arithmetic; but to compile exercises which may be used with advantage in connection with the Natural Series of Arithmetics, and which enter more fully into detail than is possible in a comprehensive work on elementary instruction. He hopes by this means to give young teachers and others, suggestive exercises to aid them in preparing lessons for primary and other classes. It is not intended to relieve teachers from the necessity of labor or the exercise of ingenuity in arousing and strengthening the perceptive faculties, and in affording discipline and training to the judgment; but to direct their attention to the *means* which may be employed to accomplish this purpose. Each section of this work is prepared expressly to be used in connection with a corresponding number of the Arithmetic of the Natural Series.

The author hopes that the following pages will tend in some small degree, at least, to assist teachers in the successful instruction of the "little ones."

For the materials of this work he has drawn largely upon the "Object Lessons," by N. A. Calkins, and the "Elementary Instruction," by E. A. Sheldon, to whom he wishes to make due acknowledgment.

New York, July 1, 1865.

TO THE TEACHER.

This Manual does not profess to give lessons in detail throughout the whole course; its object is only to suggest methods of instruction, which the teacher must himself vary and adapt to the wants of his classes. It supposes the constant exercise of the teacher's ingenuity in inventing means for creating and maintaining that lively interest, without which the best text-books must utterly fail.

Great care should be used to have these lessons thoroughly understood. If one lesson be not sufficient to make the subject clear to the pupil, two, or three, or more lessons should be given, until the children clearly understand it. They should NEVER be allowed to proceed faster in the Arithmetic than in their oral lessons; but if the exercises in the Arithmetic do not fully occupy the children's time, extra work may be given in copying and completing lessons from the blackboard.

The oral lessons should be illustrated by *objects*, as well as by the object *card-counters*, and each lesson of the Manual may be divided as time makes it necessary. The exercises prepared for the recitation should always be examined at the commencement of the lesson; a few moments thus spent will be of great service, by inducing faithfulness and attention.

The teacher should not make it an object to go rapidly through the text books. A certain time must be given for the development of the faculties, and too great haste only retards it, by introducing so many new facts that the mind becomes confused, and loses that clearness of perception, which it is so desirable to cultivate.

The teacher should confine his illustrations to the simplest portions of the tables, and not violate nature by forcing upon children explanations which they cannot understand, thus wasting his own *time, and doing* irreparable injury to the scholars. Better let children commit to memory what they *feel* they do not understand, than to teach them to recite an *explanation* which is beyond their comprehension.

Each teacher should be provided with the following apparatus for the instruction of Primary classes:—

* A set of Arithmetical card-counters.

* A set of American and English coin card-counters.

* A set of Denominate object card-counters.

All the American and English coins the teacher can obtain.

† A pair of small scales.

† A set of weights, of brass or other metal: grains, drams, ounces, and pounds.

† A gill cup and a pint measure.

† A foot and a yard measure.

† A sheet of card-board, marked with square inches.

† Twenty-seven cubic inch blocks.

* Information will be given, and specimens sent free to any person. Address Chas. Scribner & Co., 124 Grand Street, New York.

† The ingenious teacher can obtain these articles with but slight expense by applying to a tinner and cabinet-maker.

Entered, according to Act of Congress, in the year 1865, by
S. A. FELTER,
In the Clerk's Office of the District Court of the United States for the
Southern District of New York.

JOHN F. TROW,
Printer, Stereotyper, and Electrotyper,
50 Greene Street, New York.

A MANUAL
OF
ARITHMETIC.

SECTION I.

Exercise I:—*Notation.*

Objects. I. To lead children to the perception of the idea of numbers as exemplified in surrounding objects.

II. To teach the word by which they may express each number which has been learned.

III. To teach the character by which they may represent each number which has been learned.

IV. To educate the hand to form the character which represents the number thus learned.

Principles. I. Develop the idea, then give the term; educate the eye, then employ the hand; cultivate the use of language, then exercise the memory.

II. Proceed from the known to the unkno treat of the particular, then of the general; inv gate the concrete, then the abstract; study simple, then the complex.

III. First use synthesis, then, analysis: this not be a logical order, but it is the ORDER NATURE.

PLAN. 1. Successively to develop the idea each number, from *one* upward, by taking each arately in order, and exhibiting the correspond number of objects, or of pictures of objects.

2. To have the children exhibit a number objects, and, if necessary, the teacher to name number.

3. To have the teacher exhibit a number objects, and the children to name the number.

4. To have the children count the objects consecutive numbers ascending and descendi until correctly performed.

5. To have the children instructed in read the characters representing each number.

6. To have the children instructed in form the character representing each number.

7. To have the teacher give a summary, the children fix it in the memory by repetitio concert.

ABBREVIATIONS.

R. C.—*Repetition in Concert;* in which all repeat together.

S. R.—*Simultaneous Recitation;* in which all raise hands, and the teacher designates the child to give the answer.

S. A.—*Simultaneous Answer;* in which all answer together.

N. B.—Each scholar should be furnished with a set of *object cards* and a desk or table on which to place them.

LESSON I.

OBJECT.—*To develop the idea of the numbers from* ONE *to* TWENTY.

ILLUSTRATION.—*By the use of objects, thus:* How many do I hold in my hand? *s. a. One.* One what? *One apple.* And here? *One pencil.* And here? *One inkstand.* Will you show me one pencil? One hand? One finger? Clap your hands once. Charles, will you bring me one boy? One girl? Will one boy take his seat? One girl? &c.

Each child may take *one horse* from the box, and place it on the desk. What have you on your desk? *One horse.* Is it a real horse? *No.* Can it eat? *No.* Is it alive? How does it differ from a real horse? What is it of a real horse? *It is the picture of a horse.* What is the difference between a horse and the picture of a horse? [A little girl.]

A real horse can draw me in a wagon, but a picture of a horse is only to look at. When you look at the picture of a horse, what do you think of? [A little boy.] *Father's old Dick.* What, then, is the use of the picture of a horse? [Henry.] *To make us think of real horses.* That is correct. Now *r. c.: Pictures are used to represent real things.* [Require the repetition until committed to memory.] Place one cow on the desk. One watch. One squirrel. One drum. *One horse, one cow, one watch, one squirrel, &c.* How many have you of each? *One.* The teacher now writes or prints on the board as follows:

One PIG. *One* CAT. *One* DOG.

and, pointing to the first, asks: What does this represent? *s. r.* *One pig.* And this? [pointing to the second.] *One cat.* And this? *One dog.* When I point to this, what do you think of? [A little boy.] *The picture of a pig.* When you look at the picture of a pig, what do you think of? [A number of hands raised.] Charles. [Charles answers.] *A real pig.* When I point to this, what do you think of beside the picture of a pig? *s. r.* Henry. *A real pig.* What, when I point to this? *A real cat.* When I point to this? *A real dog.* How many real pigs do you think of? *One.* How many cats? *One.* Dogs? *One.* Now I will erase the words *pig*, *cat*, and *dog*. What do you *think of* when I point to the first? *One.* To the next? *One.* To the next? One. One what?

[No answer.] To the first I have printed the word *bird.* Now what do you think of? *A bird.* How many? *One bird.* I have rubbed out the word, now what do you think of? *One.* What other word could I write in the place of *bird?* *Cat, cow, horse, &c.* How many cats, cows, or horses would be represented? *One.* What, then, does *one* make you think of? *One of any kind of things.* Correct. One is called a unit, what then does a unit make you think of? *One of any kind of things.* Give an example. *One cow, one horse, &c.* *r. c.* *A unit is used to represent one of any kind of things.* [Object cards to be placed in the boxes.]

I have one cent in my hand, if I place another with it, how many shall I then have? Two what? &c. Hold up two hands. Two fingers. Bring me two pointers. Two boys. Make two claps, &c.

Place two ships on your desks; two horses; two houses. Count them. *r. c.* *One ship, two ships; one horse, two horses; one house,* &c. What is the name of the figure I have placed on the board? *Two.* How many ones in two? *Two.* How many units? I have erased the figure, who will place the figure two again on the board? [Several raise hands.] Edward. [He makes a figure one.] Is he right? *s. a.* *No.* Ella may try. [She places the right figure, but makes it too small.] [Several hands raised.] Julia. *It is too small.* Will Thomas try? [He *makes* a figure out of proportion, hands raised.]

Susie. *'Tain't good.* [Hands raised.] Martha. *Susie ought to say, "its shape is not good," instead of, "'tain't good."* [The teacher here makes a remark about the use of the words ain't and 'tain't, &c.] Susie may place it on the board. [A number of the children required to make a trial.] Now, each child may make a column of *ones* on his slate. A column of *twos* by the side of the *ones.* [Object cards to be placed in the boxes.]

Place two watches on the desk. Now place another by the side of them. How many have you now? *Three.* Three what? *Three watches,* &c. [The teacher should learn whether the pupils can apply the term *three* correctly to the number.] Who can bring me three marbles from the table? [Hands raised.] George. [George brings the correct number.] Hold up three fingers, &c. Each scholar may place three flags on the desk. Three houses, three books, three sheep. *r. c.* *One flag, two flag three flags; one house, two houses, three houses; on book, two books, &c.*

[The pupils, especially the slow and backwar should also be required to count individually.]

Who can write *one* on the blackboard? *tw three?* Is there any other way to represent *th* on the blackboard? [No answer.] [The teac writes the figure 3 on the blackboard.] Wha hat? *Three.* How does it differ from the w

hat *do* you think of when I point to it? T

Three what? *Three ones.* Can you think of any other name beside three ones? *Three units.* [The teacher then writes the words "Three pencils" on the board.] When I point to this, what do you think of? *Pencils.* How many? *Three.* How many single pencils? *Three.* John may bring me three single pencils. What character can I put in the place of the word "three?" *The figure three.* [The teacher may develop the idea of the number four in the same manner.]

N. B.—At the close of each Lesson an Exercise from the Arithmetic should be assigned, to be prepared by the children at their seats.

LESSON II.

OBJECTS.—I. *To show that each successive number is formed by the addition of* ONE *to the number preceding.*

II. *To teach the comparison of numbers with each other as to their general magnitude.*

ILLUSTRATIONS.—1. *By the use of object cards, thus:* Place on the desk one horse. *r. c. One horse.* Now place another by the side of it, *r. c. Two horses.* Add another, *r. c. Three horses,* &c., to ten. In the same manner, take one horse from ten horses, and *r. c. nine horses;* take another, *r. c. eight horses,* &c.

2. *By the use of concrete questions* Which are the more, four houses or six Eight oxen or ten oxen? Three sheep sheep? &c.

3. *By the use of abstract questions, thus:* is the greater, 4 or 6? 7 or 9? 8 or 3? 6 or

Give a number more than 4, more than 7, 11, 13, &c. Less than 8, than 19, 12, 17,

4. *By the use of problems, thus:* I had e ples, and my brother had four; which of us greater number?

If one boy studies three hours, and an hours, which of them studies the longer [These questions should be invented as need

LESSON III.

Object.—*The examination of the prepa ercises.*

Illustration.—Have all copied their e [See Arithmetic, Lesson III., Ex. I.] [Al raised.] Hold up your slates, so that I can you have done. [The teacher commends sures as circumstances may require.] He please read the first column. The class closely, for he may miss. [Henry reads.] *one, two, one, two, one.* Correctly done. *read the* sixth column? [He reads.] *Th* *four*, *two*, *three*, *three.* Again correct. Very well done. I wish to find a difficult exercise—Mary may read the *seventh.* [She reads correctly.] Let me find another more difficult. She may read the *fourth*, &c.

Now you may erase your exercises and I will dictate the lesson, and you must write it on your slates as before.

N. B.—The teacher should always call on those first who are least likely to make an error, thus, the class will not lose its self-respect by having poor recitations.

Note.—The teacher may dictate Lesson III., Exercise I., while the class copy the same; the teacher observing the mechanical execution of the work. If time permits, the Exercise should be read again by the class, and subjected to their criticism.

EXERCISE II:—*Addition.*

OBJECTS.—I. By means of objects or of object cards, to teach the addition of numbers under *ten.*

II. To teach the addition of the same numbers considered abstractly.

III. To fix in the memory the sum of any two digits, so that it may be given instantly.

PLAN.—1. To teach in succession the addition of each number represented by objects.

2. To require the formation of abstract tables in the *same order.*

3. To give concrete oral questions invented as circumstances require.

4. To fix the whole in the memory by repetition, individually, and in concert.

N. B.—Appended to each exercise is an illustration of the method of examining the prepared lessons. The teacher should not fail to require each table to be faithfully and carefully copied and completed. He should strive to excite emulation among the members of the class in regard to the mechanical execution of the work, because careless habits now formed will ever be a source of annoyance to both teacher and pupil.

LESSON I.

Object.—*To teach the addition of any digit to each of the first five.*

Illustration.—1. *By use of object cards, thus:* Each scholar place one ship on the desk, now plac
another by the side of it. How many have you no
s. r. *Two.* *r. c.* *One ship and one ship are two sh*
Place one ship with the two ships, how many h
you? *s. r.* *Three ships.* *r. c.* *Two ships and*
ship are three ships, &c. [Different objects m
used in the same manner.]

Each child may place five squirrels on his
now place four beside them, how many s
have you? *Nine squirrels.* Now place t
beside the squirrels; how many have
all? *Eleven.* Eleven what? [A little girl.]

squirrels. [A little boy.] *Squirrels and cows.* [Another child.] *Eleven nothings.* One squirrel and one cow make two what? [A little boy.] *You cannot add squirrels and cows together.* Can you add pencils to knives? Rabbits to books? It is true you can only add things which are alike. *r. c. Things can only be added to like things.* Place one ship on the desk, and then place four others by the side of it. How many have you? *s. a. Five ships. r. c. One ship and four ships are five ships.* Place two ships on your desks, then place four other ships beside them, how many ships have you now? *s. a. Six ships. r. c. Two ships and four ships are six ships*, &c.

2. *By the use of oral concrete questions, thus:* Three oxen and one ox are how many? One cat and four cats are how many? Five caps and one cap are how many? One cap and five caps how many? Which are more, one cap and five caps, or five caps and one cap? Which are more, two caps and one cap, or one cap and three caps? How many caps must be added to three caps to make four caps? How many must be added to two caps to make three caps? To five caps to make six caps, &c.

One apple and one apple are how many? Two apples and one apple are how many? 5 apples and one apple are how many? 5 apples plus 5 apples are how many? 5 ducks plus 3 ducks are how many?

Five houses and two houses are how many? 3 books and 5 books? 7 chairs and 3 chairs? 5 pigs and 7 pigs? &c.

[The teacher should vary the questions according to circumstances, always striving to keep up animation and interest in the class.]

3. *By the use of oral problems, thus:* Mary had 5 peaches, and her mother gave her 3 more; how many had she then? *Eight.*

Susan bought 9 lemons, and her mother gave her 3 more; how many had she then? *Twelve,* &c.

Note.—The addition of any digit to each of the last four may be taught in the same manner.

LESSON II.

Object.—*To fix in the memory the sum of any two digits, so that it may be given instantly.*

Illustrations.—1. *By the use of oral abstra questions, thus*: How many are 3+4? 5+1? 4+ 3+2? 4+2? 5+5? 5+1? 3+5? 5+3? Wh number added to 6 will make 7? To 3 will make To 8 will make 9? To 1 will make 8? &c.

2. *By the dictation of tables, thus:* You write the following numbers on your slates as I

tate them, thus: 4+1, 3+4, 8+2, 5+1, &c., and arrange and complete them, thus:—

(1.)

4+1=5.
3+4=7.
8+2=10.
5+1=6.

3. *By the r. c. of tables prepared on the blackboard, arranged thus:—*

(1.)

5+1
3+2
4+3
3+4

And, as the teacher points to the combination, the children complete and read orally, thus: 5 *plus* 1 *are* 6, 3 *plus* 2 *are* 5, 4 *plus* 3 *are* 7, *&c.*

4. *By requiring the sum of any two of the digits given instantly, arranged thus:—*

(1.)

3+1
3+3
4+3
2+1

As the teacher points to the first combination, individuals, or the class, in concert, should answer instantly, *four*, *six*, *seven*, *three*, &c.

Note.—The tables should be numbered for convenience of reference. When completed the class should be required to read them, subject to criticism.

In this exercise it should be the teacher's aim to cultivate promptness in answering, rapidity and accuracy in adding.

LESSON III.

OBJECT.—*The examination of the prepared exercises.*

Notes for the Teacher.—1. These tables should be copied by the scholar at his seat, before recitation; then completed from memory and read, at recitation.

2. The teacher should also dictate the same lesson to the class, requiring them to copy, complete, and read it as a class exercise.

3. Other tables, similar to those in the book, should be placed upon the blackboard, for the children to copy and complete, and thus *give them something to* DO.

4. At each recitation a portion of the time should be spent in the examination of the prepared exercises.

ILLUSTRATION.—[See Lesson VII., Ex. I.]—How many have their lessons prepared? [All raise hands except two, and the teacher only pauses to take their names, in order that the time of recitation may not be taken to attend to delinquents.] All hold up your slates so that I can see them. Now look upon your slates again. I think I saw some columns not perpendicular. All who think your work faulty in this respect may raise your hands. [Three *hands* raised.] I noticed also that a few make very large figures. How many think your figures too large? How many think your figures too small? Very well. Those who are faulty now will find it difficult to be correct next time, for such mistakes are not easily avoided. [Careless scholars should be required to recopy their work.] Who of you think you can read the second table in the first exercise correctly? [All raise hands.] I would like to find one who will miss. There is probably such a one in the class. Perhaps it is Mary. [Mary reads Table 2, Ex. I., Lesson VII.] 8 plus* 1 equals 9, 9 plus 1 equals 10, 7 plus 1 equals 8, &c. Very well done. Here is one more difficult. She may try the fourth table. You may all observe her closely. [Mary reads correctly.] Very well done. Mary must have copied her lesson very carefully to read it so well. Henry may try. I think I have the right one this time. Mistaken again! [The teacher by this means should try to keep up as much interest as possible, so that the recitation may never be dreaded by the class.]

**Note.*—The teacher should not fail to explain the meaning of the word *plus*, and to show in what connection it is used.

EXERCISE III.—*Subtraction.*

OBJECTS.—I. To teach successively the subtraction of numbers under ten, from numbers not exceeding eighteen, represented by the use of objec object cards.

II. To teach the subtraction of the same n bers taken abstractly.

III. To fix in the memory the differences t taught, so that they can be given instantly.

IV. To review addition as taught in the pre ous exercise.

PLAN.—1. To teach in succession the subtractio of each number, represented by objects.

2. To teach the addition and subtraction of eac number represented in the same manner.

3. To give concrete oral questions or problems, invented as circumstances may require.

4. To require the formation of abstract tables in the same order.

5. To fix the whole in the memory by individual and simultaneous recitations, and repetition in concert.

LESSON I.

OBJECT.—*To teach the subtraction of the first five digits.*

ILLUSTRATION.—*By the use of object cards, thus:* Each scholar may place one drum on his desk. *Now take* away one drum, how many will remain?

None. One drum from one drum leaves how many? *r. c. One drum from one drum leaves nothing.* Place two drums on each of your desks, now remove one, how many will remain? *One drum.* One drum from two drums leaves how many? *r. c. One drum from two drums leaves one drum*, &c. [Illustrate the table in the same manner, after which the children should read the table from their Arithmetics. See Lesson XXIV.]

Let each one place three flags on the desk, now remove three flags, how many will remain? *r. c. Three flags from three flags leave nothing.* You may each place four flags on the desk, now remove three flags, how many will remain? *r. c. Three flags from four flags leave one flag.* You may each place five flags on the desk, &c.

The children may each place ten watches on the desk, now each remove two, how many will remain? *Eight watches.* Remove three more, how many will remain? *Five.* Remove three more, how many will remain? *Two.* Remove two more, what will remain? *Nothing.*

Place ten books on the desk, and *r. c. two books from ten books leave eight books, two books from eight books leave six books, two books from six books leave, &c.*, removing two books each time. In the same manner, *r. c. three squirrels from nine squirrels leave six squirrels, three squirrels from six squirrels leave, &c.*

LESSON II.

OBJECT.—*To teach the addition and subtra of the first five digits.*

ILLUSTRATIONS.—1. *By the use of object c thus:* Each child may place five watches o desk. Take one away, how many will ren *Four.* Take another away, how many will ren *Three.* Place another with the number you have, how many will there be? *Four.* Plac watches on the desk. Divide them into two placing one watch in one part. How watches are there in the other part? *Five.* ten watches on the desk, and *r. c.*, thus: One from ten watches leaves nine watches; one from nine watches leaves eight watches, & moving one watch from the desk each time. teacher should vary the exercises by using objects, and adding in the same manner.]

Place ten ships on the desk. What nu taken from ten ships will leave six ships? number added to six ships will make nine s What number taken from nine ships will leave ships? What number added to four ships will six ships? &c.

Divide nine sheep into two parts, so tha part will contain one more sheep than the *Henry, what* have you? *Eight* sheep in one *and one in the other.* Charles? *Five sheep and four sheep.* All who have the same division that Henry has, may raise their hands. All who have Charles' division. All who differ from both. Divide six books in the same manner. Eight, &c. Make the differences two, three, &c.

From ten houses remove two, remove five, make the remainder five, remove three, make the remainder four, remove two, how many remain? How many must be added to make the remainder seven? How many removed to make the number three? &c.

2. *By the use of concrete oral questions, thus:* If I write five lines on the blackboard and rub out one, how many will remain? *s. r. Four.* One line from five lines leave how many? I have four cents in my hand; now I have dropped one, how many remain in my hand? *Three cents.* One cent from four cents leaves how many? One chair from six chairs leaves how many? One apple from eight apples leaves, &c.

Four apples from seven apples leave how many? Eight nuts less two nuts are how many? Nine tops less how many tops make seven tops? Twelve apples less how many apples make nine apples? Fourteen mugs less how many mugs leave nine mugs? Eleven caps less how many caps make eight caps? Seven caps? Nine caps? Six caps? &c.

One cat more than four cats are how many?

One duck more than five ducks are how n
Two birds more than five birds are how n
Two birds *plus** five birds are how many?
apples less two apples are how many? Thr
ples *minus** two apples are how many? &c.

Nine apples plus one apple are how many?
Ten apples minus one apple are how many?
Eight peaches plus one peach are how many
Nine peaches minus one peach are how man
Seven oranges plus one orange are how man
Eight oranges minus one orange are how m
Eight caps plus two caps are how many?
Ten caps minus two caps are how many?
Seven pens plus two pens are how many?
Nine pens minus two pens, &c.

3. *By the use of problems, thus:* John c
a very fine fish, but a thieving boy stole it,
many did he have to take home to his mother

Lewis bought seven nice peaches and gav
to his sister, how many had he left?

Mary had thirteen oranges, how many mu
give away to have nine oranges left?

Henry made five little stools and gave one
little sister, how many had he left? He then
one to a little lame boy, how many did he then l

---

* *Note.*—The teacher should not fail to explain the mea
the words *plus* and *minus*, and show the connection in whi
are used.

After that he made another, how many had he then? &c.

If you have ten marbles, and you give your brother six, how many will you have left? How many more will you have than he? There are four pins on the table and five on the cushion, on which is the greater number? &c. [The teacher should ask a variety of questions similar to the above, requiring only the answers.]

Note.—The addition and subtraction of the last four digits may be taught in the same manner.

LESSON III.

Object.—*To teach the addition and subtraction of the first five digits.*

Illustration.—*By the use of oral abstract questions, thus:* Seven plus one are how many? Six minus one are how many? Five plus one are how many? Five minus one are how many? Eight plus three are how many? *Eleven.* Minus five? *Six.* Minus two? *Four.* Plus nine? *Thirteen,* &c.

Subtract, *r. c.*, in succession, the numbers one to five from the numbers fourteen to five, recombining each by *addition*, thus:—

14 less 1?	13 plus 1?	14 less 2?	12 plus 2?
13 less 1?	12 plus 1?	13 less 2?	11 plus 2?
12 less 1?	11 plus 1?	12 less 2?	10 plus 2?
11 less 1?	10 plus 1?	11 less 2?	9 plus 2?
10 less 1?	9 plus 1?	10 less 2?	8 plus 2?
9 less 1?	8 plus 1?	9 less 2?	7 plus 2?
8 less 1?	7 plus 1?	8 less 2?	6 plus 2?
7 less 1?	6 plus 1?	7 less 2?	5 plus 2?
6 less 1?	5 plus 1?	6 less 2?	4 plus 2?
5 less 1?	4 plus 1?	5 less 2?	3 plus 2?
4 less 1?	3 plus 1?	4 less 2?	2 plus 2?

LESSON IV.

OBJECT.—*To fix in the memory additic subtraction, so that the sums or differences* *given instantly.*

ILLUSTRATION.—*By the dictation of tables concert exercises, thus:* $7+1$ are how many are how many? $9-1$? $8-1$? $7-1$? $6-1$? &c. What number must be taken from 10 t 9? 8? 7? &c. What number must be take 9 to make 8? 7? 6? 5? 4? 3? 2? &c. number must be taken from 8 to make 7? 4? &c.

Class take their slates and arrange in colu following tables: $4+1$, $3+1$, $8-1$; com *them thus:* $4+1=5$, $3+1=4$, $8-1=7$.

sufficient number of tables have been copied, the members of the class should be required to read them.]

Note.—The teacher should place on the blackboard such combinations as the following:—

7—1, 6—1, 9+1, and arranged in columns, which may be completed orally, thus: *r. c. Five plus one are six. Seven minus one are six, &c.*

Again, he should require, as he points to the combinations, the sums or differences given instantly, thus: 6, 7, 5, 10, &c.

Six is one more than what number? *Five.*
Five is one less than what number? *Six.*
Six is two more than what number? *Four.*
Four is two less than what number? *Six.*
Six is three more than what number?
Three is three less than what number?
Six is four more, &c.

LESSON V.

Object.—*The examination of the prepared exercises.*

Illustration.—Those who have copied their exercises may raise their hands. [See Arith., Lesson XX., Ex. II.] Henry may read the third table, &c. [After the exercise has been read by the members of

the class, the lesson may be varied by requiri
class to read the whole exercise in concert ;
requiring each member to read a single con
tion, thus, 2+3= (read, *two* plus *three* equals)

Note.—It is very important that the lesson be dictated
class, so that the *ear* as well as the *eye* may be educated.
exercises, similar to those in the Arithmetic, should be pl
the blackboard for the class to copy and complete. G
class *full employment*, let there be NO IDLENESS.

EXERCISE IV :—*Multiplication.*

OBJECTS.—I. To enable children to unde
the operation of multiplication.

II. To show that multiplication is but an
viated method of addition.

III. To teach the product of any of th
digits as contained in the multiplication tab
that it can be given instantly.

PLAN.—1. To teach in succession the multi
tion by each digit represented by objects.

2. To require the formation of abstract ta
the same manner.

3. To fix the whole in the memory by repe
individually and in concert.

LESSON I.

Object.—*To teach the multiplication of any digit by each of the first five.*

Illustration.—*By the use of objects or object cards, thus:* What have I placed on the table? *One apple.* How many times have I placed one apple on the desk? *Once.* By placing one apple on the desk, how many apples do I get? *One apple.* Place one ship on the desk. How many times have you placed one ship on the desk? *Once.* One time one ship are how many ships? *One ship.* Place one house on the desk. Now take one house from the desk. How many times have you taken one house from the desk? *Once.* How many is one house taken one time? *One house.* Now place two watches on the desk. How many times have you placed two watches on the desk? *One time.* How many are once two watches? *Two watches.*

How many are once three rabbits? *Three rabbits.* How many are once four horses? *Four horses,* &c. Place on the desks one ship, two squirrels, three mice, four birds.. r. c. *Once one ship is one ship, once two squirrels are two squirrels, once three mice are three mice, once four birds are four birds,* &c.

Place one cow on the desk, and another by the *side of it;* how many times have I placed one cow on the desk? *Two times.* How many cows on the desk? *Two cows.* How many times can you take one cow from the desk? *Two times.* How many are two times one cow? *Two cows.* Place two squirrels on the desk, and two squirrels more by the side of them. How many times have you placed two squirrels on the desk? *Two times.* How many squirrels have you on the desk? *Four squirrels.* How many times can you take two squirrels from four squirrels? *Two times.* Two times two squirrels are how many squirrels? *Four squirrels.* Place three mice on the desk and three others beside them. How many times have you placed three mice on the desk? *Two times.* How many mice have you on the desk? *Six mice.* How many times can you take three mice from six mice? *Two times.* How many are two times three mice? *Six mice.* How many are two times four birds? *Eight birds*, &c. *r. c. Two times one cow are two cows. Two times two squirrels are four squirrels. Two times three mice are six mice. Two times four birds are eight birds*, &c.

2. *By the use of oral concrete questions, thus:* How many are two times three apples? Two times four ducks? One time one peach? Two times five lemons? &c.

Four times seven apples are how many? Five *times nine* chairs? Six times eight apples? Four *times seven* pins? Three times four pens? &c.

Four times three stars are how many? Four times two stars? Six times seven stars? Five times nine stars? &c.

Repeat the following table, *r. c.*:—

Once five mugs are five mugs.
Two times five mugs are ten mugs.
Three times five mugs are fifteen mugs.
Four times five mugs are, &c.

Note.—The following may be illustrated by the object cards, if necessary.

How many times three mice make six mice? Twelve mice? Eighteen mice? Fifteen mice? Three mice? &c.

How many times six cherries make twelve cherries? Eighteen cherries? Six cherries? Twenty-four cherries? Thirty cherries? &c.

How many times seven soldiers make fourteen soldiers? Twenty-one soldiers? Thirty-five soldiers? Forty-two soldiers? &c.

How many times eight marbles make twenty-four marbles? Forty marbles? Sixteen marbles? Thirty-two marbles? &c.

3. *By the use of oral problems, thus:* If one house has six windows, how many windows will three such houses have?

If there are seven soldiers in one squad, how many soldiers will three such squads contain?

[The teacher should compose a large number of problems similar to the above.]

Note for the Teacher.—The last four digits may be taught in the same manner.

LESSON II.

OBJECT.—*To teach the addition, subtraction, and multiplication of the first five digits.*

ILLUSTRATION.—1. *By the use of the object cards, thus:* Place three ships on the desk, add two ships, how many have you? *Five.* Double the number; how many are there now? *Ten.* Subtract four; what remains? *Six.* Add two. *Eight.* Subtract eight. *Nothing.* Make it three times as many. *Nothing.* &c.

Place five drums in a row. [Require the children to give the result after each alteration.] Add two; add one; subtract four; make it three times as many. Subtract five; subtract eight; make it three times as many. Add four, &c.

Place four birds four times on the desk; how many birds are there? Take away four birds once; how many will remain? Add four birds twice, how many will there be?

Place three mice on the desk, and then place three more beside them. The class may *r. c.* *Six.* *Now add* three more, and *r. c.* Nine. Add three

more, and *r. c. twelve*, giving the result after each addition to thirty.

Note.—The teacher should reverse the process, by removing three mice from thirty, and requiring the class to give the remainder after each removal.

William bought seven drums, and then gave away two; how many had he left? His father gave him four more; how many had he then? He sold seven; how many had he left? His uncle then made the number remaining three times as great; how many drums had he then?

2. *By the use of oral concrete questions, thus:* Five times two apples are how many apples? Five times three oranges are how many oranges? &c.
Nine books and one book are how many books?
Nine books less one book are how many books?
Nine times one book are how many books?
Eight carts and one cart are how many carts?
Eight carts less one cart are how many carts?
Eight times one cart are, &c.
Nine keys and two keys are how many keys?
Nine keys less two keys are how many keys?
Nine times two keys are, &c.

3. *By the use of problems, thus:* If Fred can walk two miles in an hour, how far can he walk in two hours at the same rate?

If one book cost eight cents, how much will three books cost at the same rate?

A cow has two horns, how many horns have two cows? three cows? five cows? six cows?

A sheep has four feet, how many feet have three sheep? four sheep? five sheep?

There are nine eggs in a nest; how many eggs would there be in five such nests?

Susan bought seven apples, and gave away two, how many had she left? Her brother then made the number nine; how many did he give her? How much would they have cost him at two cents apiece, &c.

LESSON III.

Object.—*To fix in the memory the addition, subtraction, and multiplication of the first five digits; so that their sums, differences, and products may be given instantly.*

Illustration.—1. *By the use of oral abstrac questions, thus:—*

How many are—

$9+1$? $9-1$? 9×1? $9+2$? $9-2$? 9×2? &c.

How many are—

$8+1$? $8-1$? 8×1? $8+2$? $8-2$? 8×2? &c.

How many are—

$7+1$? $7-1$? 7×1? $7+2$? $7-2$? 7×2? &c.

How many are $6+1$? &c.

more, and *r. c. twelve*, giving the result after each addition to thirty.

Note.—The teacher should reverse the process, by removing three mice from thirty, and requiring the class to give the remainder after each removal.

William bought seven drums, and then gave away two; how many had he left? His father gave him four more; how many had he then? He sold seven; how many had he left? His uncle then made the number remaining three times as great; how many drums had he then?

2. *By the use of oral concrete questions, thus:* Five times two apples are how many apples? Five times three oranges are how many oranges? &c.
Nine books and one book are how many books?
Nine books less one book are how many books?
Nine times one book are how many books?
Eight carts and one cart are how many carts?
Eight carts less one cart are how many carts?
Eight times one cart are, &c.
Nine keys and two keys are how many keys?
Nine keys less two keys are how many keys?
Nine times two keys are, &c.

3. *By the use of problems, thus:* If Fred can walk two miles in an hour, how far can he walk in two hours at the same rate?

If one book cost eight cents, how much will three books cost at the same rate?

3. To fix the whole in the memory by re
individually and in concert.

LESSON I.

OBJECT.—*To teach division by each of*
five digits.

ILLUSTRATION.—*By the use of objects, o*
cards, thus: What have I on my table?
ple. How many times can I take one apple
Once. What have I placed on my table
pencils. How many times can I take one
from my table? *Two times.* Each may pl
watch on his desk. How many times can y
one watch from your desk? *Once.* Plac
drums on the desk. How many times can y
three drums from your desk? *Once.* Ho
times can you take one drum from the desk?
times, &c. Remove one drum at a time, a
once, twice, three times.

Place eight books on the desk. How man
can you take four books from the desk? *r. c*
twice.

How many times can you take two book
Once, twice, three times, four times. How
times can you take one book? *r. c. Once, tw*
Place sixteen birds on the desk. How man
can I take four birds from them? How ma

can I take two horses from ten horses? How many times can I take two horses from ten horses? How many times can two drums be taken from eight drums? How many times are two drums contained in eight drums? Two drums are contained how many times in six drums? Ten drums contain two drums how many times? &c.

Place ten flags on the desk, and divide them into two equal parts; how many flags in each part? Place nine books on the desk, and divide them into three equal parts; how many in each part? Take away one part, how many *parts* will remain? Take away one part, how many books will remain? Place sixteen birds on the desk, and divide them into four equal parts; how many birds are there in each part?

When a number of things is divided into two equal parts, one part is sometimes called *one half.* Now how many horses in *one half* of ten horses? One half of eight drums? One half of sixteen birds? When a number of things is divided into three equal parts, one part is sometimes called *one third.* How many houses in one third of nine houses? [The teacher should continue these illustrations, until the children obtain a clear idea of this form of division.]

Place twenty books on the desk, and then take away five books, and *r. c. Fifteen.* Remove five more, and *r. c. ten, five, nothing*, removing five each time. In the same manner place forty book the desk, remove five at a time, and *r. c. f* *thirty-five*, *thirty*, &c., until all are removed. I same manner place five books on the desk, ad the same manner, and *r. c. ten*, *fifteen*, *twenty*, to fifty.

Note.—The teacher should continually vary these exercise never allow himself to fall into a routine of asking questions. two forms of division should be distinctly illustrated; althou this stage of instruction, they will require no further attentio

2. *By the use of oral concrete questions, t* How many times two apples in ten apples? many fives? How many times eight birds in teen birds? How many times four birds? many times are five nuts contained in fifteen n Six pencils in twenty-four pencils? Four appl twelve apples, &c. Divide twelve apples into equal parts, how many in each part? Whe number of apples is divided into four equal p one part is sometimes called *one fourth.* Wh one fourth of eight apples? One fourth of tw apples? One half of six apples? One third o apples? When a number of things is divided five equal parts, one part is sometimes called *fifth.* What is one fifth of ten sheep? One of twenty birds? One fifth of fifteen tops? Divide thirty apples into five equal parts, *many in* each part? What is one fifth of thirt

ples? How many apples in two parts or two fifths? How many apples in three parts or three fifths?

3. *By the use of oral abstract questions, thus:* How many twos in 8? In 2? In 14? In 10? How many times can four be taken from 8? From 24? From 32? Twelve is how many times 2? How many times four? How many times 6? How many times are four contained in 8? In 12? In 20? &c. Sixteen contains 2 how many times? Contains 4? Contains 8? &c. What is one third of 9? Of 15? Of 21? Of 18? &c.

Note.—The division of the last four digits may be taught in the same manner.

LESSON II.

Object.—*To teach the addition, subtraction, multiplication, and division, of the last five digits.*

Illustrations.—1. *By the use of object cards, thus:* Place three ships on the desk, add two ships, how many have you now? Double the number. *Ten.* Subtract four. *Six.* Divide the remainder into three equal parts, how many in each part? Take away one part, how many ships remain? &c.

Place eight marbles on the desk six times, take away two times eight marbles, how many times eight *marbles* will remain? How many marbles?

time. In the same manner place forty books on the desk, remove five at a time, and *r. c. forty, thirty-five, thirty*, &c., until all are removed. In the same manner place five books on the desk, add in the same manner, and *r. c. ten, fifteen, twenty*, &c., to fifty.

Note.—The teacher should continually vary these exercises, and never allow himself to fall into a routine of asking questions. The two forms of division should be distinctly illustrated; although, at this stage of instruction, they will require no further attention.

2. *By the use of oral concrete questions, thus:* How many times two apples in ten apples? How many fives? How many times eight birds in sixteen birds? How many times four birds? How many times are five nuts contained in fifteen nuts? Six pencils in twenty-four pencils? Four apples in twelve apples, &c. Divide twelve apples into two equal parts, how many in each part? When a number of apples is divided into four equal parts, one part is sometimes called *one fourth.* What is one fourth of eight apples? One fourth of twelve apples? One half of six apples? One third of six apples? When a number of things is divided into five equal parts, one part is sometimes called *one fifth.* What is one fifth of ten sheep? One fifth of twenty birds? One fifth of fifteen tops? &c. Divide thirty apples into five equal parts, how *many* in each part? What is one fifth of thirty ap-

ples? How many apples in two parts or two fifths? How many apples in three parts or three fifths?

3. *By the use of oral abstract questions, thus:* How many twos in 8? In 2? In 14? In 10? How many times can four be taken from 8? From 24? from 32? Twelve is how many times 2? How many times four? How many times 6? How many times are four contained in 8? In 12? In 20? &c. Sixteen contains 2 how many times? Contains 4? Contains 8? &c. What is one third of 9? Of 15? Of 21? Of 18? &c.

Note.—The division of the last four digits may be taught in the same manner.

LESSON II.

Object.—*To teach the addition, subtraction, multiplication, and division, of the last five digits.*

Illustrations.—1. *By the use of object cards, thus:* Place three ships on the desk, add two ships, how many have you now? Double the number. *Ten.* Subtract four. *Six.* Divide the remainder into three equal parts, how many in each part? Take away one part, how many ships remain? &c.

Place eight marbles on the desk six times, take away two times eight marbles, how many times eight marbles will remain? How many marbles?

[The teacher should compose a large number of problems similar to the above.]

Note for the Teacher.—The last four digits may be taught in the same manner.

LESSON II.

OBJECT.—*To teach the addition, subtraction, and multiplication of the first five digits.*

ILLUSTRATION.—1. *By the use of the object cards, thus:* Place three ships on the desk, add two ships, how many have you? *Five.* Double the number; how many are there now? *Ten.* Subtract four; what remains? *Six.* Add two. *Eight.* Subtract eight. *Nothing.* Make it three times as many. *Nothing.* &c.

Place five drums in a row. [Require the children to give the result after each alteration.] Add two; add one; subtract four; make it three times as many. Subtract five; subtract eight; make it three times as many. Add four, &c.

Place four birds four times on the desk; how many birds are there? Take away four birds once; how many will remain? Add four birds twice, how many will there be?

Place three mice on the desk, and then place *three more* beside them. The class may *r. c.* *Six.* *Now add* three more, and *r.* c. Nine. Add three

more, and *r. c. twelve*, giving the result after each addition to thirty.

Note.—The teacher should reverse the process, by removing three mice from thirty, and requiring the class to give the remainder after each removal.

William bought seven drums, and then gave away two; how many had he left? His father gave him four more; how many had he then? He sold seven; how many had he left? His uncle then made the number remaining three times as great; how many drums had he then?

2. *By the use of oral concrete questions, thus:* Five times two apples are how many apples? Five times three oranges are how many oranges? &c.
Nine books and one book are how many books?
Nine books less one book are how many books?
Nine times one book are how many books?
Eight carts and one cart are how many carts?
Eight carts less one cart are how many carts?
Eight times one cart are, &c.
Nine keys and two keys are how many keys?
Nine keys less two keys are how many keys?
Nine times two keys are, &c.

3. *By the use of problems, thus:* If Fred can walk two miles in an hour, how far can he walk in two hours at the same rate?

If one book cost eight cents, how much will three books cost at the same rate?

ILLUSTRATION.—*By the use of objects, thus:* What is this which I have in my hand? *An apple.* I have cut it into two equal parts, have I more or less than I had before? What are the parts called? *Halves of an apple.* How many halves are there? What is one of the parts called? *One half.* I have cut this pear into three equal parts, what are the parts called? *Thirds.* What is one of them called? *One third.* How many thirds are there in a pear? *Three thirds.* If I take one third from three thirds how many thirds will remain? *Two thirds.* What do I mean when I say I have one third of a pear? Two thirds? Three thirds? When I have three thirds do I have any more or less than I had before the pear was cut? I have cut this orange into four equal parts, what are the parts called? What are two of the parts called? How many fourths will remain, after I have taken away two fourths? Can there be more than four fourths in one apple or one orange? [In the same manner an apple may be cut into fifths, sixths, &c.]

Instead of one apple I divide a pile of six apples into three equal parts, what are the parts called? *Thirds.* What is one of the parts called? *One third.* Thus you see if any one thing or any number of things be divided into three equal parts, the *parts* are called *thirds*, and *one* part is called one third. When I divide one apple into three equal parts, what is one part called? One third. How many apples in one part? *One third of one apple.* When I divide six apples into three equal parts, what is one part called? *One third.* How many apples in one part? *Two apples.* [Many more questions, similar to the above, should be asked.] When I ask for a third, fourth, fifth, &c., if no number of things is mentioned, one or a single thing is always understood. How much do I wish, when I ask for one fourth? *One fourth of a single thing.* How much when I ask for the one fourth of eight? *One fourth of eight single things, which is equal to two single things.* I wish to divide five apples into two equal parts, what is one of the parts called? *One half.* How many apples in one part? *Two apples and one half of one apple.* How much do I wish when I ask for one half of one apple? *One part of an apple cut into two equal parts.* How much when I ask for one half of ten apples? *One part of ten apples divided into two equal parts.* [Sufficient time should be taken, to make the class understand this distinction in regard to the use of fractional terms. One half, in one sense, means one part of any number of units divided into two equal parts; in another sense, it means one part of one unit divided into two equal parts. Lines drawn on the blackboard, strings, sticks, and other objects may be used to illustrate this subject.]

Which is the larger, one half of an apple or one third of an apple? One third of an orange or one fourth of an orange? Which is the larger, one third of an orange or two thirds of an orange?

Note.—Fifths, sixths, sevenths, eighths, and ninths may be illustrated in the same manner.

EXERCISE VII:—*Compound Numbers.*

OBJECTS.—I. *To enable children to understand the use and relative value of the denominations of compound numbers.*

II. *To fix the tables of the denominations in the memory, so that the pupils can repeat them accurately and promptly.*

LESSON I.

UNITED STATES CURRENCY.

OBJECT.—*To teach the use and relative value of the coins used in the United States currency.*

Note for the Teacher.—It is desirable, before proceeding with the following lessons on American and English currency, to give a general and conversational exercise on money, its use and convenience, the different kinds of money, and the relative value of the metals of which it is made. It may also be explained why gold and silver are used, instead of iron and lead; and why bank-notes are more convenient for the purpose of exchange, than gold or silver, &c.

Illustration.—*By the use of objects or object cards, thus:* What is this which I hold in my hands? *A cent.* What is the use of it? [A little boy.] *To buy candy.* Can you buy anything but candy with it. *Yes, cakes.* If I had a large bag full of cents, what could I buy? *A horse.* What is this piece of money? *A two-cent piece.* How much is it worth? *Two cents.* Could I buy as much candy with a two-cent piece as with a cent? *More.* How much more? *Twice as much.* Which is the more valuable, a cent or a two-cent piece? &c.

What is the name of this small piece of money? *A three-cent piece.* How many cents is this worth? *Three cents.* But a cent piece is larger and heavier than a three-cent piece. *It is not worth so much.* Why is it not worth so much? [The teacher should here tell the children, that it is more difficult to get the piece of metal of which the three-cent piece is made, than to get the metal of which the cent is made, and hence it is worth three times as much.] Of what is the three-cent piece made? *Silver.* If I wished to buy a house, which would be the more convenient money with which to pay for it, cents or three-cent pieces? Would it take more or less cents than three-cent pieces? &c.

What is the name of this piece of money? *A half-dime.* Is it worth more or less than a three-cent piece? Than a cent? Of what is it made? *Is it larger,* or smaller than a three-cent piece?

How many cents is it worth? For what two pieces of money could you exchange it? What piece of money is next greater in value after the half-dime? *The dime.* How many cents is a dime worth? How many half-dimes is it worth? How many three-cent pieces? How many two-cent pieces? Is it larger, or smaller than a two-cent piece? Why is it worth more? Where is the metal obtained of which it is made? &c. [In the same manner, the value of each of the coins should be discussed in the order of its value, and as far as possible, the teacher should be provided with them.]

If I should take a cent, and cut it into ten equal parts, and make each part into a little round piece of money, and place them in a pile; what would be the value of the pile? *One cent.* Would each little piece of money be more, or less than a cent? *Less.* How many of them would it take to make a cent? *Ten.* How many to make two cents? *Twenty.* There are really no little pieces of money such as I have described; but you can imagine them. We will call these little, imaginary pieces of money, *mills.* How many mills then in a cent? *Ten.* In a half cent? *Five.* What did we call them? Do they really exist? What do you call one of them? *One mill.* How many times greater is a cent than a mill? How many cents in a dime? Which is the greater, a cent or a dime? A mill or a dime? A mill or a half-dime? &c. How many dimes make a dollar? How many times greater is a dollar than a dime? A dollar than a cent? How many cents in a dollar? How many dollars in an eagle? How many dollar pieces make an eagle? [Questions similar to the above should be multiplied, until the relative values of the denominations are clearly understood; after which the table may be repeated, both in the usual and in the reverse order.]

Take two three-cent pieces from two half-dimes; how much remains? Take thirteen cents from two dimes; how much remains? Eighteen cents from a quarter of a dollar leave how much? Three half-dimes from three dimes leave how much? Take three dimes from a half dollar; how much will remain? &c.

Note for the Teacher.—By means of the *object-card coins*, the children should be required to buy and sell among themselves, giving and receiving the correct change.

LESSON II.

ENGLISH CURRENCY.

OBJECT.—*To teach the use and relative value of the principal English coins.*

ILLUSTRATION.—*By the* use of objects or object *cards:* What is the name of this piece of money? *The farthing.* In what country is the farthing used? Of what is it made? How many farthings make a penny? *Four.* How many farthings in a half-penny? Which do you think is the greater, a penny or a cent? *The penny.* How much greater? *Two times as great.* How many cents is a penny worth? *Two cents.* How much is a half-penny worth? How much is a farthing worth? How many mills? How many pennies in a sixpence? *Six.* How many cents is a sixpence worth? &c. [The relative values of the coins may be taught in a similar manner.]

Note for the Teacher.—The children ought to be required to buy and sell with the object-card coins, and give and receive change in English currency. They also ought to be required to exchange English coins for their value in American coins, until they can do so readily and accurately. This, however, will be difficult to accomplish in a large class.

I have a book for which I ask one shilling, how much American money should I receive?

John has a pencil for which he asks seven pence, how many cents should he receive?

Mary has a sixpence, a half-penny, and two shilling pieces, how much American money ought she to receive for them? [The table of English money may be committed to memory in the usual manner.]

LESSON III.

AVOIRDUPOIS WEIGHT.

OBJECT.—*To enable children to understand the use and the relative values of the denominations of Avoirdupois weight.*

Notes for the Teacher.—1. A general lesson on weight should precede the following lessons; in which light and heavy bodies should be contrasted—lead with cork, a bag of corn with a bag of feathers, water with wood, water with iron, &c. The necessity of standard weights should be explained, and those articles mentioned that are bought and sold by weight, as well as the different instruments used in weighing.

2. Since the grain is the smallest denomination of weights, and is that by which the denominations of the different weights are measured, the teacher should, if possible, provide himself with several pieces of brass or other metal, weighing respectively 1, 2, 3, 5, 7, and 11 grains, and a pair of small balances and metal weights of all the small denominations. Unless this is done, and the children are allowed to handle the different weights, they will derive but little practical advantage from the study of the tables. The relative values of the denominations may be taught, to some extent, by the object cards, &c.

ILLUSTRATION.—*By the use of objects or object cards.* I have a little piece of metal in my hand, which weighs a grain. It is so called because it weighs about as much as a grain of wheat. It is the smallest weight in common use, and by it we can tell the weight of all other weights. Here is an instrument which is called the scales, or a balance.

You see two cups fastened by strings to a rod, called a beam. If I put two pieces of lead of equal weight, one in each of the cups, they will balance. I have put $27\frac{1}{3}$* of these little grains in one of the cups, and this little weight called a dram, in the other; can you tell me what happens? *They balance.* The dram is the smallest denomination of Avoirdupois weight. This weight is used in buying and selling butter, meat, sugar, salt, and many other things. You can see a picture of the dram in your Arithmetics. How many drams must I put in the scales to balance an ounce? *Sixteen.* How many to balance half an ounce? To balance a quarter of an ounce? Which will weigh the more, a dram or an ounce? How many times will an ounce out-weigh a dram? [The teacher should allow the children to assist as much as possible in these experiments.]

Place on your desks enough drams to make one ounce. Divide them into two equal parts, what is one part called? Which will weigh the more, *one half* of sixteen drams, or *one half* an ounce? How many ounces make a pound? Which is worth the more, an ounce of butter or a pound of butter? Place on the desk enough ounces to make a pound. How many dram weights does it take to weigh an an ounce? How many ounce weights does it take to weigh a pound? [The tables should be committed to memory in the usual and reverse order.]

* *Note.*—The exact weight of a dram Avoirdupois is $27\frac{11}{32}$ *grains.*

LESSON IV.

TROY WEIGHT.

OBJECT.—*To enable the children to understand the use and relative values of the denominations of Troy weight.*

ILLUSTRATION.—The little grain which I showed you in the last lesson, is the smallest denomination used in Troy weight. This weight is used by jewelers, in buying and selling gold, silver, precious stones, and jewelry. How many of these grains does it take to weigh a pennyweight? How many grains in half a pennyweight? Which is greater, a grain or a pennyweight? If you should cut a pennyweight into 24 equal parts, what would one of the parts weigh? What would two of them weigh? How many pennyweights weigh an ounce? &c. [The table may be learned in the usual manner.]

LESSON V.

APOTHECARIES' WEIGHT.

OBJECT.—*To enable the children to understand the use and relative values of the denominations of Apothecaries' weight.*

ILLUSTRATION.—[The teacher may proceed in the same manner with the grain as in Troy weight.]

If you were going to buy flour, which weight would the flour-dealer use? Which is the smallest denomination of Avoirdupois weight? What weight would you use in buying gold? Butter? Beef? Silver? Medicine? Which weight is used most? Which do grocers use? Which druggists? Which jewelers? &c.

LESSON VI.

LONG MEASURE.

Note for the Teacher.—1. Before proceeding with the following lessons, a general lesson on length, width, thickness, and capacity should be given to the children. To give an idea of length, compare sticks, strings, lines on the blackboard, short distances, &c., with the standard measure of a foot or a yard. The attention may be called to pieces of tape, ribbon, strips of paper, lath, boards, width of aisles, &c., to develop the idea of width. Paper, cardboard, boards, plank, and blocks may be used to illustrate cubic measure. Cups, baskets, pails, barrels, &c., may be used to illustrate capacity. It must not be expected, however, at this stage of the instruction, that the children will obtain a lucid idea of all the denominations. It would be better to attempt to explain only a few of the smaller, and especially those that are more easily recognized by the senses. It would be well to have the children feel that these are things which, at present, they cannot understand, but which in time will be made plain to them; rather than that the teacher should do violence to nature by attempting to explain what is beyond their comprehension.

2. The attention of the children should be called to the illus-

trations of Long and of Square measure in the Arithmetic. The conversations should be read, and questions asked in regard to differences of distance, the distinctness and the size of objects as seen in pictures. In the illustration of square measure, attention should be called to the apparent dimensions of fields or lots, &c.

OBJECT.—*To enable the children to understand the uses and relative values of the denominations of Long measure.*

ILLUSTRATION.—Let each child take an inch rule from the box. How many inches long is this book? [Five or six hands are raised.] *Three*, *Two*, *Five*, *Seven*, *Six.* Mary may come and measure it. [Mary measures and counts the inches.] *One*, *two*, *three*, *four*, *five*, *six.* The book is six inches long. John estimated its length correctly, and he can measure the next object. How wide is this book? [A number of children answer; John measures it, and finds it four inches long.] How many inches long is this knife? [The teacher should be provided with a foot rule with which the children should be allowed to measure.]

Note.—The relative values of a yard, rod, link, and chain may be developed in the same manner, after which the table may be committed.

LESSON VII.

SQUARE MEASURE.

OBJECT.—*To enable the children to understand* *the uses and relative values of the different denominations used in measuring surface or area.*

ILLUSTRATION.—Let each child take a square inch from the box, and place it on the desk. How long is it? How wide is it? How many will it take to make a row two inches long? How many to make a square two inches each way? How many to make a square three inches each way? How many to cover a surface four inches long and two inches wide? How many to cover a surface six inches long and two inches wide? How many to cover a place six inches long and three inches wide? How many rows are there? How many square inches in a row? &c. [The teacher should draw lines upon a square foot of card board in such a manner as to represent the number of square inches contained in a square foot. The children, by cutting pieces of paper an inch square and applying them to surfaces, can readily find the area. The table can be learned in the usual manner.]

LESSON VIII.

CUBIC MEASURE.

OBJECT.—*To enable the children to understand the uses and relative values of the different denominations of Cubic measure.*

ILLUSTRATION.—John, will you measure this little block? How long is it? How wide is it? How thick is it? This little block is called a cubic inch. Here are a number of these little blocks, can you make a layer three inches long, two inches wide, and one inch high? How many rows are there? How many blocks in one row? How many blocks in the layer? When the layer is but one block high, it is said to be but one *tier* high. Will you place another tier of blocks on the pile? How many inches high is the pile? How many inches long? How many inches wide? Make a pile three inches long, three inches wide, and three inches high. How many rows of blocks does the pile contain? How many blocks in each row? How many tiers of blocks? How many blocks in the pile? How many can be seen? How many cannot be seen? How many in the centre of the pile? [The teacher should give a large number of problems similar to the above, after which the table may be committed in the usual manner.]

LESSON IX.

LIQUID MEASURE.

OBJECT.—*To enable the children to understand the uses and relative values of the denominations of Liquid measure.*

ILLUSTRATION.—What have I in my hand? *A cup.* How much water does it hold? A gill. What can I put in this cup? *Molasses, water, milk, &c.* I have here a basin of water, [The teacher proceeds to fill the cup four times from the basin.] Can you tell me what I am doing? *Measuring the water.* With what am I measuring it? *With a gill cup.* How many times have I filled the cup? *Four times.* How much water did the basin hold? *Four gills.* What other name can we give four gills? *One pint.* What kind of a basin then can we call this? *A pint basin.* Why? *Because it holds four gills, or one pint.* If you should fill the gill cup three times out of the pint of water, how much water would remain in the basin? [The teacher may carry the illustrations as far as he deems necessary. The object cards may also be used to fix the relative values of the denominations in the mind.]

LESSON X.

DRY MEASURE.

Object.—*To enable the children to understand the uses and relative values of the denominations of Dry measure.*

Illustration.—What is the name of this little cup? *A gill cup.* What do we measure with a gill cup? *Liquids.* What is the name of this wooden measure? *A pint measure.* What do we measure with it? *Corn, potatoes, and wheat.* I have filled it with sand, how many times could I fill the gill cup from it? *Five times.** The Dry measure pint is how many times as large as a gill? *Five times.* A Liquid measure pint is how many times as large as a gill? *Four times.* Which holds the most, a Dry measure pint or a Liquid measure pint? *A Dry measure pint holds a gill more than a Liquid measure pint.* What is the smallest denomination of Dry measure? *Pints.* [With a pail of sand or grain the other denominations may be illustrated in the usual manner.]

N. B.—At each recitation, review questions should be asked on all the tables which the class have learned.

* *Note.*—The capacity of a pint of Dry measure is 4.654 times that of the gill in Liquid measure.

LESSON XI.

MEASURE OF TIME.

Object.—*To enable the children to understand the relative values of the denominations used in the measurement of time.*

Illustration.—How do you find the time of day? How could we tell when it is noon if we had no clocks or watches? [The teacher can explain the different methods and instruments used to measure time, as the dripping of water, the hour glass, &c. The teacher should count or beat seconds, *requiring* the children to join in the exercise, until they have acquired considerable accurac should also require them to sit without mov thirty seconds, then for a minute. To te train their judgment, require them to estim time which has elapsed since a given sign From the object cards require them to give sition of the hands at a given time. The fa clock may be drawn on the blackboard, the placed in different positions, and the child quired to tell the time indicated.]

LESSON XII.

CIRCULAR AND ANGULAR MEASURE.

Note.—But little can be explained in regard to circul gular measure, and perhaps it had better not be attemp the children enter the next book.

LESSON XIII.

MISCELLANEOUS TABLES.

Note.—These tables may be illustrated in the same m the previous tables. Care should be taken to do ***but little***, ***that little*** WELL. The Roman notation can be reviewed b ing the children to render Arabic numbers into Roman on the blackboard, writing them as follows:—

7=VII.
3=III.
12=XII.
20=XX.

SECTION II.

PRIMARY ARITHMETIC.

Notes for the Teacher.—1. The object of this section is to give a few additional directions in regard to the method of using the Primary Arithmetic. Also, to give different formulas for the solution of problems, in order that the teacher may select those which seem best adapted to his pupils. We advise, however, that he select ONE, and confine himself to it. For a trial first of one, and then of another, will only confuse and embarrass his pupils.

2.—Unless the class have been through the First Lessons, Section I. of the Manual should be given before proceeding with the following Exercises.

Exercise I.—*Notation and Numeration.*

(See Primary Arithmetic.)

LESSON I.

Object.—*To teach the notation and numeration of the numbers from one to ten.*

Illustration.—(See Lesson I.*) How are numbers usually written in arithmetic? In how many ways can I write *five* on the blackboard? *Three.* Ella, will you write *five* on the blackboard in three different ways? What is the first method of notation called? *The word method.* The second? *The Roman method.* The third? *The Arabic method.* Which method is used in arithmetic? Edward, will you write all the different characters in the Arabic method? How many are there? Name them. Which represents the greatest number of single things? Which the least number of single things? Which represents no number, or nothing? When I write *five apples* on the board, what do you think of? *Five real apples.* If I rub out the word apples, what does the *five* make you think of? *Five of any kind of things.* How many single things do you think of? What is *one* sometimes called? *A unit.* When I ask for a number of apples, how many could you bring me? *Five, three, one, ten, &c.* Is five apples a number? Three? One? It is true, *one* apple or any collection of apples is called a *number* of apples. What kind of a number is *five apples?* *A number with a name.* What kind of a number is *five?* *A number without a name.* A number with a name is called a *denominate number;* what kind of number is five peaches? Seven oranges? By what other name is a denominate number sometimes called? *A concrete number.* A number without a name is called an *abstract* number; what kind of number, then, is *five*? Eight? Eleven? Seven?

---

* *References thus placed refer to the Primary Arithmetic.*

Note for the Teacher.—After the facts contained in the following summary have been sufficiently discussed by the class, the children should be required to commit it to memory by repetition in concert. Only a few of the terms and definitions are given—so few as not to burden or confuse the memory, and yet enough to give it exercise.

SUMMARY:—1. *Numbers in Arithmetic are usually expressed by figures.*

2. *Ten figures are used in the Arabic Notation.*

3. *A Unit is one.*

4. *An Abstract Number* is a number used without reference to any object.*

5. *A Concrete or Denominate Number is a number used with reference to some object or collection of objects.*

* When definitions are given, the language usually conforms to the definitions in the *Arithmetical Analysis*, in order to obviate the necessity of committing a set of new definitions.

LESSON II.

Note.—For methods of recitation and study, see Primary Arithmetic, Note for the Teacher, Less. III.

OBJECT.—*To teach the notation and numeration of numbers from ten to nine hundred.*

Illustration:—(See Lessons III.–IX.) How many units does the figure *six* represent? 8? 9? 2? Write seven on the blackboard. Write seven apples. Six. Six peaches. How many figures does it take to write 20? 30? 40? What are the figures? Which has the greater value? Which occupies the first place? Which the second? What is the name of the first place? What is the name of the second place? How many ones are there in 30? How many tens in 30? In 40? In 60? &c. How many units in 70? 56? 20? &c. How many units make a ten? How many figures does it take to write 22? 33? Which has the greater value? In what place do we write units? *In units' place.* In what place do we write tens? *In tens' place.* Which is units' place? Which is tens' place? How many units and tens in 44? How many ones? In 37? In 86? In 39?

(Less. X.–XIII.) When I write 94 on the board, how many figures do I write in units' place? How many in tens' place? When I write 100 on the board, how many figures do I use? What is the first place called? The second place? The third place? In 346, how many units are there in units' place? How many tens in tens' place? How many hundred in hundreds' place? Every three places is called a period, as; $\overbrace{000}^{\text{Period.}}$. Write a period on the blackboard. What is the name of the first period of every number? *Units' period.* Write 2 in the first place of units' period (002). What is the 2 called? 2 *units.* Write 5 in the second place of the period (052). What is the 5 called? 5 *tens.* Write 6 in the third place (652). What is the 6 called? 6 *hundreds.* How do we read the 6, 5, and 2? *Six hundreds, five tens, and two units.* There is a shorter way of reading it; thus we say, *six hundred and fifty-two.* [The teacher should explain to the children the contraction of *five tens* to fifty, and the omission of units, &c.] Write 6 tens and 3 units, and read them. Write 4 hundreds, 3 tens, and no units. 7 hundreds, 0 tens, and 5 units. [The notation and numeration of the first period should be thoroughly learned, before proceeding to the next.]

SUMMARY.—1. *Every three places form a period.*

2. *The First Place of every period is called units' place.*

3. *The Second Place of every period is called tens' place.*

4. *The Third Place of every period is called hundreds' place.*

LESSON III.

OBJECT.—*To teach the notation and numeration of the numbers comprised in the first three periods.*

Illustration.—(Lessons XIII.-XVI.) How many periods does the number 327 occupy? How many periods does the number 864,437 occupy? *Two periods.* What is the name of the first? *Units.* Of the second? *Thousands.* How many thousands are there? *Eight hundred and sixty-four.* How many units? *Four hundred and thirty-seven.* Write 221 in units' period? Write 463 in thousands' period.

Note.—The notation and numeration of millions' period may be taught in the same manner. After which the table should be taught as far as millions in the usual and the reverse order.

Summary.—1. *The Second Period of every number is called Thousands.*

2. *The Third Period of every number is called Millions.*

Recapitulation.—1. Notation is the method of expressing numbers by words, figures, and letters.

2. Numbers in arithmetic are usually expressed by figures.

3. Ten figures are used in the Arabic notation.

4. A Unit is one.

5. An Abstract number is one used without reference to any object.

6. A Concrete or Denominate number is one used with reference to some object or collection of objects.

7. Every three figures of a number form a Period.

8. The First Period of a number is called Units.

9. The Second Period of a number is called Thousands.

10. The Third Period of a number is called Millions.

11. The First Place of every period is called Units.

12. The Second Place of every period is called Tens.

13. The Third Place of every period is called Hundreds.

Note.—The children should be required to review the above as often as once a week, by repetition and by questions.

EXERCISE II.—*Addition.*

OBJECT.—I. *To teach the solution of simple problems in addition, by the use of an arithmetical formula.*

II. *To teach the rapid and accurate combination of numbers by the blackboard exercise.*

LESSON I.

NOTES FOR THE TEACHER.—1. *Preparation.*—In preparing the mental exercises, the children should, after copying each problem, compose three or four examples similar to the one copied, and arrange them as in the following lesson.

2. If the children cannot write, require them to copy the lesson in *italic* letters.

PROBLEM.—1. John had 5 oranges, and his brother gave him 1; how many had he then?

(*a.*) Mary had six oranges, and her mother gave her 1; how many had she then?

(*b.*) Susan had four peaches, and her mother gave her one more; how many had she then?

(*c.*) Julia had 7 sticks of candy, and her aunt gave her one more; how many had she then?

PROBLEM.—2. James has 6 apples, and his sister gives him one more; how many has he then?

(*a.*) Charles has five oranges, and his brother gives, &c.

3. *Solution.**—When the Teacher reads the problem and the scholar does not repeat it, the following formula may be used:—

FORMULA.—If John had 5 oranges, and his brother gave him 1; he then had the sum of 5 oranges and 1 orange, which is 6 oranges.

Therefore, if John had 5 oranges, and his brother gave him one more; he then had 6 oranges.

When the scholar repeats the problem the following formula is preferable:—

PROBLEM.—John had 5 oranges, and his brother gave him 1; how many had he then?

FORMULA.—He must have had the sum of 5 oranges and 1 orange, which is 6 oranges. Therefore, John had 6 oranges.

The following is still more brief, and may be used when brevity is necessary. The teacher reads the problem, and the scholar continues, thus:

FORMULA.—He had the sum of 5 oranges and 1 orange, which is 6 oranges. Therefore, John had 6 oranges.

---

* *Note.—If the teacher prefer* he may require the scholar to repeat the *problem, before giving* the solution.

4. *Recitation.*—Some form of solution should be given for each problem copied from the Arithmetic; but the answers only may be required for the examples composed by the pupils. This method has the advantage of furnishing the scholars *something to do* in the preparation of their lessons; while, at the same time, it teaches reading, writing, orthography, composition, and arithmetic. The teacher may occasionally read problems from the book, requiring only the answers.

For other methods of recitation see Introduction to Primary Arithmetic.

4. *Tables.*—The best method of learning the tables is by means of the blackboard exercises.

5. *Blackboard Exercises.*—For methods of instruction see notes on Lesson II., Primary Arithmetic.

N. B.—In conducting a drill in the blackboard exercises, the teacher should first write but two or three combinations of each exercise, then one or two more, until the exercise is completed, committing each so thoroughly that the sums may be given instantly. One exercise is sufficient for a single recitation, and at least ten minutes should be spent upon it.

In the column exercises, let the combinations of three or four figures be recited thus: 2, 4, 6, 8. Then repeat until they are committed to memory. After that, add another, thus: 2, 4, 6, 8, 10, &c. The recitations in these exercises should ALWAYS be *animated.*

6. For the methods of recitation of the written exercises, see Introduction to Primary Arithmetic, Exercise X. Scholars who recite incorrectly should be requred to repeat their work until it is accurate. The teacher should require promptness in recitation. Ten minutes are sufficient to examine an exercise of twenty examples, *if the class* work rapidly.

7. [Lesson IX.] The teacher, should, by questions, show clearly the method of adding one for every ten; an explanation of the *method* is sufficient, the *reason* will be given in the next step.

8. Oral exercises similar to the following may be given to the class:—

(1.) Require all the children to commence at the same time to write the multiples of 2; as, 2, 4, 6, 8, 10, 12, to fifty, in order to see which scholar can complete it first. Let one read the numbers, while the class observe and correct errors.

(2.) The teacher may dictate 2+1+2+3+2+2, &c., to fifty; while the scholars write on the slates, and add at the same time.

(3.) The teacher may require the answers only, to combinations similar to the following: 2+3+2 are how many? 4+2+3 are how many?

(4.) For other oral exercises see Introduction to Primary Arithmetic.

N. B.—By methods previously given in the first section of the Manual, the teacher should develop the ideas contained in the following summary, if not already understood, before requiring the class to commit it to memory.

SUMMARY.—1. Things can be added only to like things.

2. Addition is the process of finding the sum of two or more numbers.

3. The Answer in Addition is called the Sum.

4. The Sign of Addition is a small perpendicular cross.

5. The Sign of Equality is two, short, parallel, *horizontal* lines.

Exercise III.—*Subtraction.*

Notes for the Teacher.—1. *Preparation.*—The same as in addition.

2. *Solution.**—When the teacher reads the problem, and the scholar does not repeat it, the formula in the book may be used. (See Prim. Arith., Sec. III. Less. II.)

When the scholar repeats the problem, the following formula is preferable:—

Problem.—Susan had 3 apples, and gave away 1; how many had she left?

Formula.—She must have had left the difference between 3 apples and 1 apple, which is 2 apples; therefore Susan had 2 apples left.

When brevity is necessary, the teacher reads the problem, and the scholar continues, thus:—

Formula.—She had the difference between 3 apples and 1 apple, which is 2 apples; therefore, she had 2 apples left.

3. *Recitation.*—The same as in addition. For methods of recitation see Introduction to Primary Arithmetic.

Oral exercises similar to those in addition should be frequently given.

4. [Lesson XIX.] Each couplet of the examples should be, at first, explained separately thus: (160th Example), 32 from 81, 54 from 73, &c. A full analysis of the method may be found in the Arithmetical Analysis; (Intermediate) ¶ 37.

N. B.—Develop the ideas by oral instruction, and then have the children commit to memory the following

Summary.—1. Subtraction is the process of finding the Difference between two numbers.

---

* If the teacher prefers, he may require the pupil to repeat *the problem* before giving the formula.

bers usually written in arithmetic? In how many ways can I write *five* on the blackboard? *Three.* Ella, will you write *five* on the blackboard in three different ways? What is the first method of notation called? *The word method.* The second? *The Roman method.* The third? *The Arabic method.* Which method is used in arithmetic? Edward, will you write all the different characters in the Arabic method? How many are there? Name them. Which represents the greatest number of single things? Which the least number of single things? Which represents no number, or nothing? When I write *five apples* on the board, what do you think of? *Five real apples.* If I rub out the word apples, what does the *five* make you think of? *Five of any kind of things.* How many single things do you think of? What is *one* sometimes called? *A unit.* When I ask for a number of apples, how many could you bring me? *Five, three, one, ten, &c.* Is five apples a number? Three? One? It is true, *one* apple or any collection of apples is called a *number* of apples. What kind of a number is *five apples?* *A number with a name.* What kind of a number is *five?* *A number without a name.* A number with a name is called a *denominate number;* what kind of number is five peaches? Seven oranges? By what other name is a denominate number sometimes called? *A concrete number.* A number without a name is called an *abstract* number; what kind of number, then, is *five*? Eight? Eleven? Seven?

Note for the Teacher.—After the facts contained in the following summary have been sufficiently discussed by the class, the children should be required to commit it to memory by repetition in concert. Only a few of the terms and definitions are given—so few as not to burden or confuse the memory, and yet enough to give it exercise.

SUMMARY:—1. *Numbers in Arithmetic are usually expressed by figures.*

2. *Ten figures are used in the Arabic Notation.*

3. *A Unit is one.*

4. *An Abstract Number* is a number used without reference to any object.*

5. *A Concrete or Denominate Number is a number used with reference to some object or collection of objects.*

* When definitions are given, the language usually conforms to the definitions in the *Arithmetical Analysis*, in order to obviate the necessity of committing a set of new definitions.

LESSON II.

Note.—For methods of recitation and study, see Primary Arithmetic, Note for the Teacher, Less. III.

OBJECT.—*To teach the notation and numeration of numbers from ten to nine hundred.*

When the scholar repeats the problem, the following formula is preferable:—

Problem.—I divided 10 apples equally between 2 boys; how many did each boy receive?

Formula.—1 boy will receive *one half* of 10 apples, which are 5 apples; therefore, if 2 boys received 10 apples, 1 boy received 5 apples.

Some may prefer the following formula:—

Formula.—1 boy received *one half* as much as 2 boys; 2 boys received 10 apples; therefore 1 boy received *one half* of 10 apples, which are 5 apples.

When brevity is necessary, the teacher may read the problem, and the scholar continue thus:—

Formula.—1 boy received *one half* of 10 apples, which are 5 apples; therefore 1 boy received 5 apples.

N. B.—In the second formula of division [See Less. X.] similar abbreviated forms may be used.

3. *Recitation.*—For methods of recitation, oral exercises, blackboard exercises, &c., see similar exercises in addition and subtraction.

4. *Analysis.*—A full analysis of both forms of division may be found in the Arithmetical Analysis, (Intermediate), pages 58, 59.

SUMMARY.—1. Division may be considered a short method of subtraction.

2. The number to be divided is called the Dividend.

3. The number by which we are to divide is called the Divisor.

4. The answer in division is called the Quotient.

5. The number left after dividing is called the *Remainder.*

6. The sign of division is a short horizontal line with a dot above and another below it.

Note.—Fractions are treated at large in the fundamental rules.

EXERCISE VI.—*Denominate Tables.*

The steps should be thoroughly committed to memory in the order indicated by the following questions:—

How many steps does it require to change mills to cents? *One.* Cents to mills? Dollars to dimes? Dollars to cents? *Two:—First, dollars to dimes, then, dimes to cents.* How many steps to change farthings to pence? Shillings to pounds?

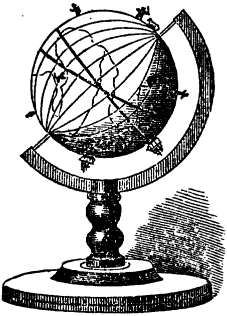
Which has the greater value,—a farthing or a penny? A penny is how many times as great as a farthing? A pound is how many times as great as a shilling? What part of a penny is a farthing? *One fourth.* Of a shilling is a penny? Of a pound is a shilling?

Note.—The scholars should continue practical experiments with the higher denominations of weights and measures, in the manner shown in the illustrations given in the Manual, Section I., Exercise VII.

N. B.—The remaining sections of this work will be added as soon as possible, making it a complete Manual of instruction for the entire series.

AN IMPORTANT EDUCATIONAL INVENTION.

PERCE'S MAGNETIC GLOBE.



Patented March 16th, 1864,
By Elbert Perce.

This elegant educational apparatus is made like any terrestrial globe, with all the continents, oceans, and islands of the earth's surface. The globe, however, possesses the properties of attracting and holding fast any magnetic objects placed upon its surface, even as the earth holds fast by the power of gravitation. A box which goes with the globe contains a dozen objects which may be applied to its surface, affording numerous and striking illustrations of many of the phenomena of the earth which heretofore have been found almost impossible to explain intelligibly to children. Men of different races and colors—Europeans and Asiatics, Ethiopians, Indians and Esquimaux—may also be placed on those parts of the globe which they inhabit; the lion roams in the deserts of Africa, the elephant and the bear in other regions, and ships and steamers are traversing the great deep. We have a miniature world before us.

From the Indiana School Journal, December, 1864.

"A Globular Ne Plus Ultra. Mr. Elbert Perce has recently patented a Magnetic Globe, accompanied by Magnetic Objects. These objects set upon the surface, adhere in whatever position placed, whether up or down, thus *de facto* showing men, ships, and houses, with their heads, masts, and roofs downwards, just what the teacher's imagination has been steadily and muddily affirming, and what the pupil's senses have been as steadily and obstinately denying. Additional, here is scientific accuracy, namely a truthful explanation of the laws of attraction. Hence the teacher can with absolute truthfulness say to the pupil, the same force that holds these miniature men, ships, and houses upon this globe, also holds the real men, ships, and houses on the earth, save only this difference, one is the attraction of magnetism, and the other the attraction of gravitation."

STYLES AND PRICES.

Common School Magnetic Globe, 5 In. Dia., Plain Stand, ...	**$5.00**
" " " " 5 In. Dia., Brass Meridian, ...	**7.00**
Grammar & High School Magnetic Globe, 12 In. Dia., Plain Stand, . .	**20.00**
Library Magnetic Globe, 12 In. Dia., Brass Meridian, ...	**25.00**

ONE DOZEN MAGNETIC OBJECTS, representing men of different races and colors, ships, steamers, lighthouses, and animals, accompany each Globe without additional cost.

EXTRA MAGNETIC OBJECTS.

TWENTY-FOUR NATIONAL FLAGS, elegantly and correctly colored, mounted on magnets. In neat box. Price, ... **$1.50**

PROFILES OF CONTINENTS, mounted on magnets, prepared expressly for the Grammar and High School Magnetic Globe, by Prof. Arnold Guyot. Price, ... **$1.50**

☞ All Globes and Objects are securely packed in neat boxes, and can be *safely sent any distance* by Express, on receipt of the money.

CHARLES SCRIBNER & CO.,
124 Grand Street, New York.

☞ ***Agents Wanted.***

☞ *Circulars*, with a full description of this attractive invention, sent free on *application*.

Popular Arithmetical Series.

I.

FELTER'S

FIRST LESSONS IN NUMBERS.

ILLUSTRATED.

II.

FELTER'S PRIMARY ARITHMETIC.

III.

FELTER'S

INTERMEDIATE ARITHMETICAL ANALYSIS.

IV.

FELTER'S

COMMERCIAL ARITHMETICAL ANALYSIS.

V.

FELTER'S

TEACHER'S MANUAL OF ARITHMETIC.

VI.

FELTER'S

Intellectual Arithmetical Analysis.

(*In Press.*)

VII.

FELTER'S UNIVERSITY ARITHMETIC.

(*In Preparation.*)

* * *

SHELDON'S PRIMARY READER,

WITH CHARTS,

ON THE OBJECT-LESSON SYSTEM.

* * *

CHARLES **SCRIBNER & CO.,**

4 *Grand Street,* NEW YORK.

Popular Arithmetical Series.

I.
FELTER'S
FIRST LESSONS IN NUMBERS.
ILLUSTRATED.

II.
FELTER'S PRIMARY ARITHMETIC.

III.
FELTER'S
INTERMEDIATE ARITHMETICAL ANALYSIS.

IV.
FELTER'S
COMMERCIAL ARITHMETICAL ANALYSIS.

V.
FELTER'S
TEACHER'S MANUAL OF ARITHMETIC.

VI.
FELTER'S
Intellectual Arithmetical Analysis.
(*In Press.*)

VII.
FELTER'S UNIVERSITY ARITHMETIC.
(*In Preparation.*)

◆

SHELDON'S PRIMARY READER,
WITH CHARTS,
ON THE OBJECT-LESSON SYSTEM.

◆

CHARLES SCRIBNER & CO.,
124 *Grand* Street. NEW YOR